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# EXPERIMENTAL PRODUCTION OF PODZOLIZATION

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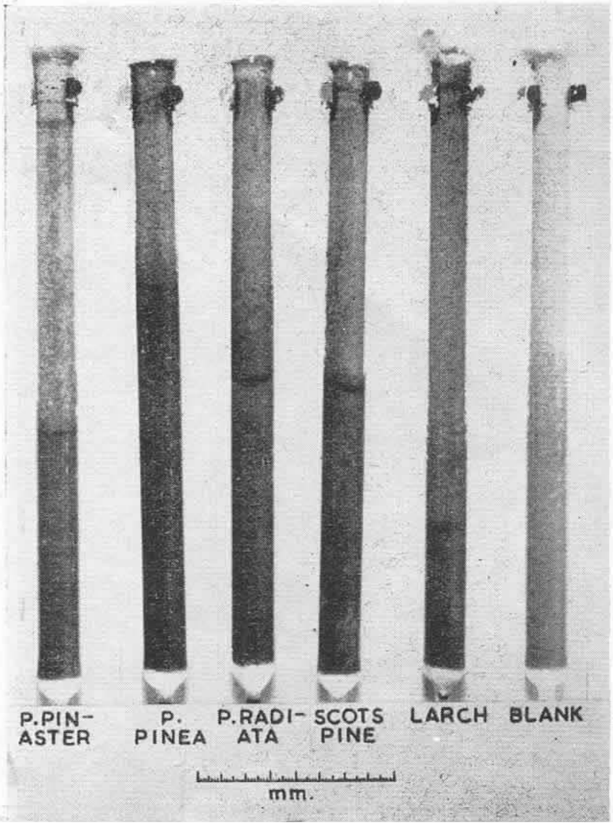
The action of water extracts of fallen tree leaves in causing solution and reduction of ferric oxide under sterile conditions has been described previously.[1–3] On the basis of these results it is possible to explain the formation of the bleached horizon of a podzolized soil, but the mechanism by which the B, i.e. iron enriched, horizon is formed remains unclear.

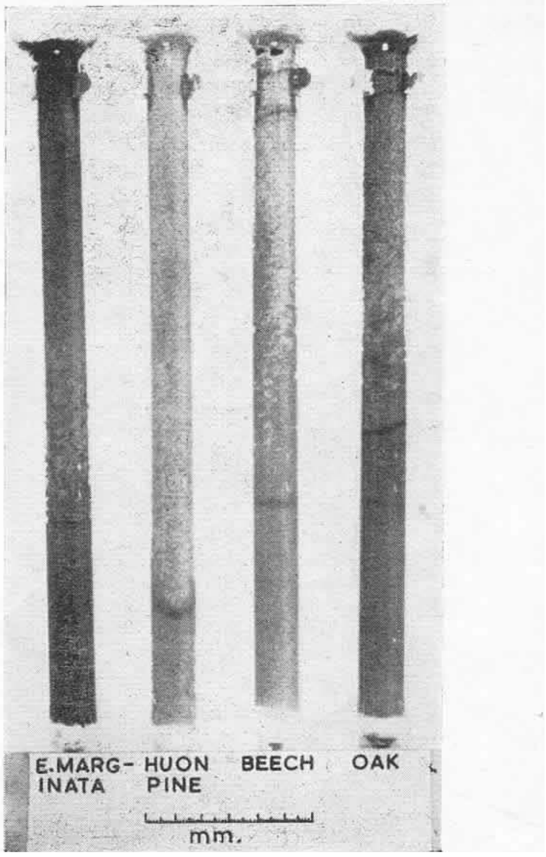
Recently, by the action of leaf extracts on columns of ferruginous sand, it has been found possible to produce what appear to be authentic B horizons.

In these experiments, glass tubes 25 × 2 cm. were filled with ferric oxide-coated quartz sand. The sand was introduced into the tubes as a slurry in distilled water so that no air bubbles were entrapped in the mass. The particle size of the sand and the dimensions of the tubes were such that no air was drawn into the sand mass when the water was allowed to drain freely from the columns. The water-holding capacity of each column was of the order of 15 ml.

The leaf extracts were prepared by treating 2 gm. of the air-dry leaves overnight with 100 ml. of cold water, in the presence of a few drops of toluene, and filtering. On alternate days, 5 ml. portions of the extracts, which were stored under toluene, were pipetted on to the columns. In most cases an immediate darkening of the ferric oxide occurred on addition of the solutions, the extent of this effect varying from species to species. After eight additions the darkening of the top few cm. constituted the only visible differentiation down the columns. After being left in the dark for 3–4 weeks, with no further additions of the extracts, the tubes appeared as shown in the accompanying photograph.

With the exception of the columns treated with extracts of *Eucalyptus marginata* or oak leaves, none of the columns showed an $A_1$ horizon, and the colour of the $A_2$ horizons was not very different from that of the blank. In view of the very short duration of the treatment, this last point is hardly surprising. The appearance of the *E. marginata* column, however, was very striking; a dull black $A_1$ horizon extended to a depth of some 8 cm. and was followed by an $A_2$ horizon of about 9 cm. thickness. The latter was appreciably lighter in colour than the $A_1$ and showed a distinct





trace of the original brown colour. The B horizon had a sharp upper boundary, at a depth of 17 cm., and a diffuse lower edge. This horizon appeared blue-black when viewed in sunlight.

In all cases the B horizons were situated 1–2 cm. below the point to which the sand had dried out, so that in view of the time taken for the B horizons to be formed, it appears that the formation of this horizon is connected with drying and/or aeration of the upper levels.

It can be seen from the photograph that the depth at which the B horizon occurs varies considerably from species to species. As mentioned above, when the columns were allowed to drain freely, the water level did not fall below the top of the sand filling. When the leaf extracts were introduced, however, the water levels fell to varying depths, presumably because of surface tension differences, and possibly the depth at which the B horizon ultimately formed was determined by the depth to which air was thus permitted to enter the sand mass.

The absence of $A_1$ horizons, with the exception of the *E. marginata* and oak columns has already been mentioned. It has previously been observed that when an aspen leaf extract is treated with kaolinite, the consequent sorption of some of the constituents of the extract causes an increase in the ability of the extract to dissolve ferric oxide. It therefore seems probable that the inclusion of clay in the column fillings would result not only in the formation of $A_1$ horizons, but also in an enhanced $A_2$ formation.

Since the iron content of the water draining from the columns was in all cases considerable, only part of the iron removed from the top levels could have been redeposited in the B horizons.

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**References**

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